Original Article

Assessment of Individual Activities of Daily Living and its Association with Self-Rated Health in Elderly People of Taiwan[☆]

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A R T I C L E   I N F O

S U M M A R Y

Background: Functional status is an important component of health status of the elderly. However, few studies have discussed the correlation between health status and each item of the activities of daily living scales (ADLs). The aim of this study was to investigate both the prevalence of functional disability in each activity of daily living (ADL) item and the association between each ADL item and the self-rated health of the elderly.

Methods: A stratified random sample of 302 male and 298 female elderly residents, aged 65 and older, in Miaoli County was drawn. Baseline characteristics, functional status of each ADL item, and self-rated health of the participants were collected.

Results: The results showed that the self-rated health status was excellent, good, or fair in 72.3% of the sample, and bad or poor in 27.7%. The most common disability among basic ADLs was transfers (9.3%); the most common disability among instrumental ADLs (IADLs) was transportation (24.7%). Multiple logistic regression analysis revealed that bathing, feeding, dressing, bowel and bladder control, transfers, transportation, and responsibility for own medication, were independently associated factors of self-rated health. Bowel and bladder control (odds ratio, 4.72; 95% confidence interval, 1.76−12.67) and feeding (odds ratio, 4.27; 95% confidence interval, 1.61−11.37) were the leading items correlated with self-rated health.

Conclusion: In summary, in terms of self-rated health, the most important ADLs were bowel and bladder control and feeding. Further study is warranted to investigate the effects of restoring specific health-related ADL to improve the health of the elderly.

1. Introduction

Aging of populations is a global trend. According to statistics compiled by the Department of Health, in September 1993, Taiwan reached the threshold to be defined by the World Health Organization (WHO) as an aging country, with elderly citizens ≥ 65 years comprising > 7% of the entire population. Even now, their proportion continues to rise significantly. By 2131, the elderly will comprise 20% of the entire population in Taiwan, as estimated by The Council for Economic Planning and Development, Executive Yuan. As the older population rapidly expands, more people will suffer from chronic and degenerative diseases, and the number of people with functional impairment or disabilities will increase. Thus, medical staff will be caring for more disabled elderly patients in the future[1−3].

The functional decline of the elderly may be due to normal aging or the sequelae of illness. Two instruments are frequently used in assessing the functional status of the elderly. One is the basic activities of daily living scales (ADLs)[4], i.e., items such as feeding, bathing self, bowel and bladder control, dressing and undressing, chair/bed transfers, personal hygiene and toileting. The other is the instrumental activities of daily living scales (IADLs), i.e., use of the telephone, shopping, food preparation, housekeeping, ability to handle finances, transportation and responsibility for own medication[5]. Many studies have demonstrated that functional disabilities in activities of daily living (ADLs), are risk factors of hospitalization, institutional residence, increased healthcare expenditures, poor quality of life[1,6,7].

☆ All contributing authors declare no conflict of interest.

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Self-rated health status represents one's self-report regarding general personal health status. Although subjective, it is a valuable indicator of health evaluation in practice[8]. It not only represents the current and long-term health status, but also predicts illness and disability in the future[9]. Moreover, both the functional status of ADL and the self-rated health status, are important indicators of elderly health status and determinants of quality of life and mortality rate[10-12]. Despite being disease-free, elderly individuals require good ADL to maintain their health status. It has been found that the self-rated health of the elderly is correlated with their ADL functioning[13]. However, the definition of functional disability varies. Some studies used the total scores of the functional index as their basis of evaluation[8]; others used a single or some specific item[14]. To the best of our knowledge, none of these studies have investigated the association between each item of the ADL and the health status of the elderly[15].

Rehabilitation programs can be designed to improve an individual's ADL and restore functional capacity[16,17]. Therefore, it would be beneficial to understand which activities have more influence on the health status of the elderly. The aim of this study was to investigate both the prevalence of functional disability in each item of the ADL scales, and to analyze the association between the functional status of each ADL item and the self-rated health of the elderly.

2. Materials and methods

In this cross-sectional study, there were 600 elderly residents, aged $\geq$ 65 years from 18 townships of Miaoli County, a county in western Taiwan. Data collection was assisted by the Social Welfare Bureau of Miaoli County. The proportionate stratified random sampling method was used to make the sample size proportionate to the ratio of population aged $\geq$ 65 years within each township. Moreover, control characteristics were taken by gender and the ratio of the population within each age group, which increased the resemblance of the properties of the sample to those of the parent population. The sampling relied on household registration as the sampling frame, and the participants were sampled by simple random sampling. One set of substitute samples was selected at the same time, to avoid certain circumstances, such as refusal to be interviewed, or not living at the registered address. From August 1 to October 31, 2007, trained interviewers visited the participating elderly citizens. All participants gave their informed consent. The survey included baseline characteristics of the elderly, ADL (including feeding, bowel and bladder control, dressing and undressing, chair/bed transferring, bathing self, toileting), as well as IADL (including seven items: use of telephone, shopping, food preparation, doing housework, ability to handle finances, responsibility for own medication, and transport outdoors). Each item was evaluated either as functionally independent or functionally disabled requiring assistance. In addition, the self-rated health status was evaluated by the interviewees themselves; the evaluation included: general health status, comparison of current health status with that of the previous year, and comparison of personal health status with that of others in the same age group. Five levels could be chosen, including: very bad, not good, fair, good, or excellent. If the participants were unable to answer by themselves, due to hearing impairment, language problems, or medical illness, the main caregiver would answer and re-confirm the answers.

2.1. Statistical analyses

The software SAS for Windows version 8.0 (SAS Institute, Cary, NC., USA) was used for statistical analysis. The descriptive method was used first to analyze the baseline characteristics of the interviewees, the prevalence of functional disability in each item of the ADL, and the proportion of each self-rated health status level. Continuous variables were expressed as the mean value $\pm$ standard deviation. Categorical variables were presented in percentages. The Chi-square test was used to compare the differences in the functional status of the elderly in different gender and age groups. Frequency distributions of functional disability by different age groups were tabulated and tested for trend across age using a Cochran−Armitage Chi-square test. Furthermore, we defined healthy individuals as those who rated their health status as fair, good, and excellent, for analyzing the association between self-rated health and each activity of daily living. Participants who rated their health as very bad and not good were considered unhealthy. The Chi-square test was used to assess the correlation of each item of the ADL and the self-rated health status. A stepwise multiple logistic regression model was used to analyze two categorically significant self-rated health status outcome variables (healthy and unhealthy) for each item of the ADL scales. The significance level for all analyses was $\alpha = 0.05$.

3. Results

Six hundred elderly individuals, with a mean age of 73.3 ± 6.2 years, were collected. The sample consisted of 302 males (50.3%) and 298 females (49.7%). When grouping the participants by age, the more advanced the age, the smaller the number of participants is; in this group, those aged 65−69 years accounted for 34.7% of the sample, those aged 70−74 years, 25.5%, those aged 75−79 years, 22.0%, and those aged $\geq$ 80 years, 17.8%. The goodness of fit test confirmed that the distribution of age groups and gender in our sample was the same as that of the national population aged $\geq$ 65 years.

Table 1 shows the prevalence of functional disability for each ADL item. In the basic ADLs, 9.3%, the largest group, had difficulty in chair/bed transfers, followed by difficulty in bathing self (8.5%); difficulty in feeding was the least prevalent (7.0%). In the IADLs, 24.7% had difficulty in transport outdoors; difficulty in shopping was next at 22.8%, and difficulty in responsibility for own medication (16.8%) was the least prevalent. In our study, the more advanced the age, the higher the prevalence of functional disability in each ADL item is. The relationship of the prevalence of functional disability in each ADL item across different ages groups showed a stepwise fashion (all p for trend < 0.001). In addition, the elderly female group had a higher proportion of functional disability in each ADL than the male group. Table 2 shows the proportion of functional disability in each ADL item between men and women. In elderly women, there was a greater prevalence in disability in drug preparation, ability to handle finances, shopping, transport outdoors, and use of the telephone. Table 3 reveals the percentages of different self-rated health levels, with good at 31.7% being the largest, followed by fair at 29.8%.

A significant correlation was found between health status and each ADL item, i.e., eating, bowel and bladder control, dressing and undressing, chair/bed transferring, bathing self, toileting, transport outdoors, and. Multiple logistic regression model showed that perceived health status was independently associated with function disability in feeding, bowel and bladder control, dressing and undressing, transferring to and from bed, bathing self, transport outdoors, and responsibility for own medication. Table 4 shows the odds ratio and 95% confidence interval of each ADL item. Bowel and bladder control (odds ratio, 4.72; 95% confidence interval, 1.76−12.67) and feeding (odds ratio, 4.27; 95% confidence interval, 1.61−11.37) were the two strongest and leading ADL items correlated with health status.

Table 1
Functional disability in activities of daily living among individuals aged 65 and older stratified by age.

	Functional disability						
	All samples (n = 600)	65−69 y (n = 208)	70−74 y (n = 153)	75−79 y (n = 131)	≧ 80 y (n = 108)	p*	p for trend**
Basic ADLs							
Feeding	7.0%	3.4%	3.9%	9.9%	14.8%	< 0.001	< 0.001
Bowel and bladder control	7.3%	3.9%	4.6%	9.2%	15.7%	< 0.001	< 0.001
Dressing/undressing	8.2%	3.4%	3.9%	10.7%	20.4%	< 0.001	< 0.001
Chair/bed transfers	9.3%	4.3%	5.9%	10.7%	22.2%	< 0.001	< 0.001
Bathing self	8.5%	4.3%	4.6%	9.2%	21.3%	< 0.001	< 0.001
IADLs							
Using of telephone	17.7%	7.7%	13.7%	17.6%	42.6%	< 0.001	< 0.001
Shopping	22.8%	11.1%	17.7%	23.7%	51.9%	< 0.001	< 0.001
Food preparation	20.2%	12.0%	9.2%	26.0%	44.4%	< 0.001	< 0.001
Housekeeping	17.7%	8.7%	9.2%	23.7%	39.8%	< 0.001	< 0.001
Ability to handle finances	22.7%	12.5%	15.7%	22.9%	51.9%	< 0.001	< 0.001
Responsibility for medication	16.8%	9.6%	10.5%	20.6%	35.2%	< 0.001	< 0.001
Transport	24.7%	13.0%	21.6%	29.8%	45.4%	< 0.001	< 0.001

ADLs = activities of daily living; IADLs = instrumental activities of daily living.
*p value based on Chi-square test.
**p value based on Cochran−Armitage Chi-square test.

4. Discussion

The prevalence of functional disability in each basic ADL item was between 7% and 9.3%. That of each IADL item ranged from 16.8% to 24.7%. Except for toileting, all the basic ADL items had a significant association with self-rated health status. In IADL, only transport outdoors and responsibility for own medication were independently associated with self-rated health status.

Although many studies have reported that women have a higher proportion of functional disability in ADL than men[18,19], our study showed no statistically significant difference in basic ADL between men and women. In IADL, i.e., responsibility for own medication, ability to handle finances, shopping, transport outdoors, and use of telephone, women had a higher proportion of functional disability than men. Our study found that a higher proportion of women had difficulties in activities that required more physical strength or were more complicated, i.e., responsibility for own medication, ability to handle finances, shopping, transport outdoors, and use of telephone. However, there was no difference between men and women in food preparation and doing housework. This might be due to the traditional Chinese concept that men are the breadwinners and women are the homemakers, and women were mainly responsible for managing the household and preparing meals.

Many studies have demonstrated that the more advanced the age, the higher the percentage of individuals with functional disability[20]. However, functional decline did not exhibit a linear relationship with increasing age − it accelerated with increasing age[21]. Our study found that in either basic or instrumental activities of daily living, the 75−79-year-old and > 80-year-old age groups had a higher percentage of functional disability than the 65−69-year-old and 70−74-year-old groups. In addition, the prevalence of functional disability in IADL was higher than that in basic ADL. This might be explained by the fact that basic ADL represent the basic physiological functions of human beings, and IADL are influenced by societal, environmental, educational, and cultural factors, which are more complicated. Thus, it was inferred that IADL might be more sensitive than basic ADL in screening individuals with a functional disability[22].

Health status in the elderly encompassed physical, mental, and societal comfort, as well as good functional status. Many studies have demonstrated the association between the health status of the

Table 2
Functional disability in basic activities of daily living among individuals aged 65 and older stratified by gender.

	Men (n = 302)		Women (n = 298)		p value*
	Functional independence	Functional disability	Functional independence	Functional disability	
Basic ADLs					
Feeding	283 (93.7%)	19 (6.3%)	275 (92.3%)	23 (7.7%)	0.49
Bowel and bladder control	285 (94.4%)	17 (5.6%)	271 (90.9%)	27 (9.1%)	0.11
Dressing/undressing	280 (92.7%)	22 (7.3%)	271 (90.9%)	27 (9.1%)	0.43
Chair/bed transfers	278 (92.0%)	24 (8%)	266 (89.3%)	32 (10.7%)	0.24
Bathing self	278 (92.0%)	24 (8%)	271 (90.9%)	27 (9.1%)	0.62
Toileting	285 (94.3%)	17 (5.7%)	270 (90.6%)	28 (9.4%)	0.08
IADLs					
Using of telephone	259 (85.8%)	43 (14.2%)	235 (78.9%)	63 (21.1%)	0.02
Shopping	249 (82.4%)	53 (17.6%)	214 (71.8%)	84 (28.2%)	0.002
Food preparation	244 (80.8%)	58 (19.2%)	235 (78.9%)	63 (21.1%)	0.55
Housekeeping	255 (84.4%)	47 (15.6%)	239 (80.2%)	59 (19.8%)	0.17
Ability to handle finances	256 (84.8%)	46 (15.2%)	208 (69.8%)	90 (30.2%)	< 0.001
Responsibility for medication	266 (88.1%)	36 (11.9%)	233 (78.2%)	65 (21.8%)	< 0.001
Transport	254 (84.1%)	48 (15.9%)	198 (66.4%)	100 (33.6%)	< 0.001

ADLs = activities of daily living; IADLs = instrumental activities of daily living.
*p value based on Chi-square test.

Table 3
Self-rated health status of individuals aged 65 or older stratified by age, gender.

		Excellent	Good	Fair	Not good	Very bad
All samples		65 (10.8%)	190 (31.7%)	179 (29.8%)	139 (23.2%)	27 (4.5%)
Age (y)	65−69	29 (13.9%)	73 (35.1%)	49 (23.6%)	52 (25%)	5 (2.4%)
	70−74	18 (11.8%)	50 (32.7%)	51 (33.3%)	31 (20.3%)	3 (1.9%)
	75−79	13 (9.8%)	35 (26.5%)	49 (37.1%)	31 (23.5%)	4 (3.1%)
	≧ 80	5 (4.7%)	32 (29.9%)	30 (28.0%)	25 (23.4%)	15 (14.0%)
Gender	Men	51(16.9%)	104 (34.4%)	81 (26.8%)	53 (17.6%)	13 (4.3%)
	Women	14 (4.7%)	86 (28.9%)	98 (32.9%)	86 (28.9%)	14 (4.6%)

ADLs = activities of daily living.

elderly and their functional status in ADL[23,24]. However, most of these studies used total scores to represent functional status, which made it difficult to know the impact of each ADL item had on the health status. Our study illustrated that, except for toileting, functional disability in all ADL items was significantly correlated with an poor self-rated health status. Bowel and bladder control and feeding were the two leading items associated with health status. In IADL, transport outdoors and responsibility for own medication disabilities were significantly associated with an unhealthy status.

Functionally disabled elderly persons may recover their functional independence under proper rehabilitation treatment[17,25]. However, the more advanced the age or the more ADL items that show functional disability, the greater the possibility is of becoming permanently disabled and the lesser the chance is to restore their function[21]. Rehabilitation can help disabled elderly individuals regain independence in certain aspects of daily activities, through muscle-strength training, balance training, adjustment of household environment, and utilization of assistive devices[26,27]. Since it is difficult to help an extremely senile person recover functional independence in all ADL items[28], it is more practical to target the items which have greater impact on health status.

This study had several limitations. First, sampling in this study was limited to the elderly in Miaoli County who were visited at their homes. Elderly individuals staying in nursing institutions were not included, which might influence the external validity of the findings. Second, this study was cross-sectional in design, and the data may not necessarily reflect all time points. Third, we did not control for the number and type of chronic medical conditions of the participants, which might have reduced the magnitude of some associations. Despite the potential limitations, this was the first study to investigate the prevalence of each item of basic ADLs and IADLs in elderly individuals aged above 65 years in Taiwan.

The sample investigated in this study was large, random and representative. We believe that these results suggest that different items of ADL may exert different impacts on health perceptions in elderly people.

5. Conclusion

The prevalence of functional disability in each basic ADL item was between 7% and 9.3%, and that of each IADL item ranged from 16.8% to 24.7% among elderly people in Taiwan. Bowel and bladder control and feeding were the two leading ADL items correlated with health status. This warrants further investigation of the effects of restoring specific health-related ADL to improve the health of the elderly.

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Table 4
Logistic regression in the relationship between functional status of ADLs and poor self-rated health.

	Functional status	Odds ratio	95% CI	p
Feeding	Independence	1		0.004
	Disability	4.27	1.61−11.37	
Dressing/undressing	Independence	1		0.003
	Disability	4.27	1.63−11.18	
Bathing self	Independence	1		0.004
	Disability	3.91	1.59−9.58	
Chair/bed transfers	Independence	1		0.001
	Disability	3.95	1.73−9.00	
Bowel and bladder control	Independence	1		0.002
	Disability	4.72	1.76−12.67	
Transport	Independence	1		0.01
	Disability	1.93	1.15−3.25	
Responsibility for medication	Independence	1		0.03
	Disability	1.93	1.06−3.51	

ADLs = activities of daily living.

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